We claim:

1. A process for the production of a compound comprising carbon, the process comprising providing a fuel source comprising at least one organic compound to a reactor, forming a film of the fuel source on a wall of the reactor, providing a source of oxygen comprising molecular oxygen to the reactor, contacting the fuel source with the source of oxygen, forming a vaporized mixture of fuel and oxygen, then contacting the vaporized mixture of fuel and oxygen with a catalyst under conditions effective to produce a reaction product comprising a carbon containing compound.

2. The process of claim 1 wherein the process is carried out under autothermal conditions.

3. The process of claim 1 wherein the vaporized mixture of fuel and oxygen contacts the catalyst for at least about 5 milliseconds.

4. The process of claim 3 wherein the vaporized mixture of fuel and oxygen contacts the catalyst for no greater than about 25 milliseconds.

5. The process of claim 1 wherein the organic compound is a liquid hydrocarbon with at least 6 carbon atoms.

6. The process of claim 5 wherein the liquid hydrocarbon is a C_6-C_{30} hydrocarbon.

7. The process of claim 1 wherein the process is carried out without adding water.

8. The process of claim 1 wherein the catalyst comprises a metal selected from the group consisting of a Group VIII metal, a Group IB metal, tin, and combinations thereof.

9. The process of claim 8 wherein the metal comprises rhodium.

10. The process of claim 1 wherein the source of oxygen comprises air.

11. The process of claim 1 further comprising contacting the fuel source and source of oxygen with water.

12. A process for the production of an alkene, the process comprising:
providing a fuel source comprising at least one liquid hydrocarbon;
providing at least one source of oxygen comprising molecular oxygen;
delivering the fuel source to a reactor comprising a wall;
forming a film of the fuel source on the reactor wall;
contacting the fuel source with the source of oxygen;
forming a vaporized mixture of fuel and oxygen; and
contacting the vaporized mixture of fuel and oxygen with a catalyst under conditions effective to produce a reaction product comprising an alkene.

13. The process of claim 12 wherein the process is carried out under autothermal conditions.

14. The process of claim 12 wherein the vaporized mixture of fuel and oxygen contacts the catalyst for at least about 5 milliseconds.

15. The process of claim 14 wherein the vaporized mixture of fuel and oxygen contacts the catalyst for no greater than about 25 milliseconds.

16. The process of claim 12 wherein the liquid hydrocarbon comprises at least 6 carbon atoms.

17. The process of claim 12 wherein the alkene is ethylene.

18. The process of claim 17 wherein at least about 35 percent of the alkene that is reacted forms ethylene.

19. The process of claim 12 wherein the alkene is propylene.

20. The process of claim 19 wherein at least about 15 percent of the fuel source that is reacted forms propylene.

21. The process of claim 20 wherein no greater than about 50 percent of the fuel source that is reacted forms propylene.

22. The process of claim 12 wherein the catalyst comprises a metal disposed on a support, wherein the metal is selected from the group consisting of a Group VIII metal, a Group IB metal, tin, and combinations thereof.

23. The process of claim 22 wherein the metal is selected from the group consisting of rhodium, platinum, and mixtures thereof.

24. The process of claim 23 wherein the catalyst further comprises tin.

25. The process of claim 22 wherein the support is a ceramic foam monolith.

26. The process of claim 12 wherein carbon is present in the fuel source in an atomic ratio of at least about 0.8:1 carbon to oxygen.

27. The process of claim 6 wherein carbon is present in the fuel source in an atomic ratio of no greater than about 5:1 carbon to oxygen.

28. The process of claim 12 wherein the source of oxygen comprises air.

29. The process of claim 12 wherein the source of oxygen is pure O_2.

30. The process of claim 12 further comprising contacting the fuel source and source of oxygen with water.

31. The process of claim 12 wherein the vaporized mixture of fuel and oxygen contacts the catalyst at a flow rate of at least about 0.5 standard liters per minute.

32. The process of claim 31 wherein vaporized mixture of fuel and oxygen contacts the catalyst at a flow rate of no greater than about 20 standard liters per minute.

33. The process of claim 12 wherein the fuel source and the source of oxygen are vaporized and mixed substantially simultaneously.

34. The process of claim 33 wherein the mixture of fuel and oxygen is heated to a temperature of at least about 25°C above the boiling point of the fuel source prior to contacting the catalyst.

35. The process of claim 34 wherein the fuel source and the source of oxygen are heated to a temperature of no greater than about 150°C above the boiling point of the fuel source prior to contacting the catalyst.

36. A process for the production of an α-olefin, the process comprising:
providing a fuel source comprising at least one liquid *n*-alkane;
providing at least one source of oxygen comprising molecular oxygen;
delivering the fuel source to a reactor comprising a wall;
forming a film of the fuel source on the reactor wall;
contacting the fuel source with the source of oxygen;
forming a vaporized mixture of fuel and oxygen; and
contacting the vaporized mixture of fuel and oxygen with a catalyst under conditions effective to produce a reaction product comprising an α-olefin.

37. The process of claim 36 wherein the process is carried out under autothermal conditions.

38. The process of claim 36 wherein the vaporized mixture of fuel and oxygen contacts the catalyst for at least about 5 milliseconds.

39. The process of claim 38 wherein the vaporized mixture of fuel and oxygen contacts the catalyst for no greater than about 25 milliseconds.

40. The process of claim 36 wherein the *n*-alkane comprises at least 6 carbon atoms.

41. The process of claim 36 wherein at least about 20 percent of the fuel source that is reacted forms an α-olefin.

42. The process of claim 41 wherein about 100 percent of the fuel source that is reacted forms an α-olefin.

43. The process of claim 36 wherein the catalyst comprises a metal disposed on a support, wherein the wherein the metal is selected from the group consisting of a Group VIII metal, a Group IB metal, tin, and combinations thereof.

44. The process of claim 43 wherein the metal is selected from the group consisting of rhodium, platinum, and mixtures thereof.

45. The process of claim 44 wherein the catalyst further comprises tin.

46. The process of claim 43 wherein the support is a ceramic foam monolith.

47. The process of claim 36 wherein carbon is present in the fuel source in an atomic ratio of at least about 2:1 carbon to oxygen.

48. The process of claim 47 wherein carbon is present in the fuel source in an atomic ratio of no greater than about 10:1 carbon atom to oxygen atom.

49. The process of claim 36 wherein the source of oxygen comprises air.

50. The process of claim 36 wherein the source of oxygen is pure O_2.

51. The process of claim 36 further comprising contacting the fuel source and the source of oxygen with water.

52. The process of claim 36 wherein the vaporized mixture of fuel and oxygen contacts the catalyst at a flow rate of at least about 0.5 standard liters per minute.

53. The process of claim 52 wherein the vaporized mixture of fuel and oxygen contacts the catalyst at a flow rate of no greater than about 20 standard liters per minute.

54. The process of claim 36 wherein the fuel source and the source of oxygen are vaporized and mixed substantially simultaneously.

55. The process of claim 54 wherein the mixture of fuel and oxygen are heated to a temperature of at least about 25°C above the boiling point of the fuel source prior to contacting the catalyst.

56. The process of claim 55 wherein the fuel source and the source of oxygen are heated to a temperature of no greater than about 150°C above the boiling point of the fuel source prior to contacting the catalyst.

57. A process for the production of synthesis gas, the process comprising:
providing a fuel source comprising at least one liquid hydrocarbon;
providing at least one source of oxygen comprising molecular oxygen;
delivering the fuel source to a reactor comprising a wall;
forming a film of the fuel source on the reactor wall;
contacting the fuel source with the source of oxygen;
forming a vaporized mixture of fuel and oxygen; and

contacting the vaporized mixture of fuel and oxygen with a catalyst under conditions effective to produce a reaction product comprising synthesis gas.

58. The process of claim 57 wherein the process is carried out under autothermal conditions.

59. The process of claim 57 wherein the vaporized mixture of fuel and oxygen contacts the catalyst for at least about 5 milliseconds.

60. The process of claim 59 wherein the vaporized mixture of fuel and oxygen contacts the catalyst for no greater than about 25 milliseconds.

61. The process of claim 57 wherein the liquid hydrocarbon comprises at least 6 carbon atoms.

62. The process of claim 57 wherein at least about 60 percent of the fuel source that is reacted forms synthesis gas.

63. The process of claim 57 wherein the catalyst comprises a metal disposed on a support, wherein the metal is selected from the group consisting of a Group VIII metal, a Group IB metal, tin, and combinations thereof.

64. The process of claim 63 wherein the metal comprises rhodium.

65. The process of claim 63 wherein the support is a ceramic foam monolith.

66. The process of claim 57 wherein carbon is present in the fuel source in an atomic ratio of at least about 0.3:1 carbon to oxygen.

67. The process of claim 66 wherein carbon is present in the fuel source in an atomic ratio of no greater than about 2:1 carbon to oxygen.

68. The process of claim 57 wherein the source of oxygen comprises air.

69. The process of claim 57 wherein the source of oxygen is pure O_2.

70. The process of claim 57 further comprising contacting the fuel source and the source of oxygen with water.

71. The process of claim 57 wherein the vaporized mixture of fuel and oxygen contacts the catalyst at a flow rate of at least about 0.5 standard liters per minute.

72. The process of claim 71 wherein the vaporized mixture of fuel and oxygen contacts the catalyst at a flow rate of no greater than about 20 standard liters per minute.

73. The process of claim 57 wherein the fuel source and the source of oxygen are vaporized and mixed substantially simultaneously.

74. The process of claim 73 wherein the mixture of fuel and oxygen is heated to a temperature of at least about 25°C above the boiling point of the fuel source prior to contacting the catalyst.

75. The process of claim 74 wherein the fuel source and the source of oxygen are heated to a temperature of no greater than about 150°C above the boiling point of the fuel source prior to contacting the catalyst.